

What is claimed is:

1. A composition having enhanced thermal conductivity, comprising, in combination:
 - a. a powder having average particle sizes in the nanometer to micron size range;
 - b. a coating imparted to the powder particles; and
 - 5 c. a heat transfer medium selected from the group of monomers, interpolymers, polymers, and phase change materials.
2. The composition of claim 1, wherein the coating further comprises a coating capable of acting as at least one of imparting corrosion resistance and acting as a dispersant.
3. The composition of claim 2, wherein the coating acts a dispersant of the powder in the
10 heat transfer medium by at least one of increasing settling time of the powder, passivating the powder, reducing interfacial tension of the powder and increases adhesion to the powder.
4. A process for transferring heat between a heat source and a heat sink, comprising the step of interposing between the heat source and the heat sink a heat transfer composition
15 comprising a surface-coated powder, the coating imparting improved thermal conductivity properties to the powder relative to uncoated powder.
5. The process of claim 4, further comprising including the step of suspending the coated powder in a heat transfer medium.
6. The process of claim 4, wherein the surface-coated powder is prepared by one of:
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 - a. complexing a coating compound with powder particles;
 - b. adsorbing a coating compound on surfaces of the powder particles; and
 - c. imparting a metal coating onto surfaces of powder particles and subsequently complexing the metal coating with another coating.
7. The process of claim 4, wherein the coating compound is in sufficient amount to form at
25 least a molecular monolayer of the coating compound on surfaces of the powder particles.
8. The composition of claim 1 wherein the powder further comprises an average particle size of less than 10 microns.
9. The composition of claim 8 wherein the powder further comprises an average particle size within the range of 10 nm to 2 μ .

10. The composition of claim 1 wherein the powder is selected from the group of metal, metal alloy, organic metal compounds, inorganic metal compounds, carbon and combinations thereof.
11. The composition of claim 10 wherein the powder is selected from the group of metals consisting of copper, titanium, nickel, beryllium, iron, silver, gold, alloys thereof, blends thereof, and compounds thereof.
12. The composition of claim 10 wherein the powder is selected from the group of carbons consisting of graphite, carbon nanotubes, diamond, fullerene carbons of the general formula $(C_2)_n$, where n is an integer of at least 30, and blends thereof.
13. The composition as claimed in claim 1 wherein the heat transfer medium is selected from the group consisting of solids, fluids, and phase change materials.
14. The composition as claimed in claim 1 wherein the heat transfer medium is an interpolymer.
15. The composition of claim 14 wherein the interpolymer is prepared by polymerizing alpha-olefin monomer with vinylidene aromatic monomer and aliphatic vinylidene monomers with a volume ratio between 10:1 to 1:100 and a weight percent of 99 to 1 percent.
16. The composition of claim 15 wherein the interpolymer is further prepared with polymerizable ethylenically unsaturated monomer.
17. The composition of claim 13 wherein the heat transfer medium is selected from the group consisting of conjugated polymers, crystalline polymers, amorphous polymers, epoxies, resins, acrylics, polycarbonates, polyphenylene ethers, polyimides, polyesters, acrylonitrile-butadiene-styrene (ABS); polyethylene, polypropylene, polyamides, polyesters, polycarbonates, polyphenylene oxide, polyphenylene sulphide, polyetherimide, polyetheretherketone, polyether ketone, polyimides, polyarylates, styrene, poly(tetramethylene oxide), poly(ethylene oxide), poly(butadiene), poly(isoprene), poly(hydrogenated butadiene), poly(hydrogenated isoprene), liquid crystal polymers, polycarbonate, polyamide-imide, copolyimides precursors, reinforced polyimide composites and laminates made from said polyimides, polyphenylated polynuclear aromatic diamines, fluorocarbon polymers, polyetherester elastomers, neoprene, polyurea, polyanhydride, chlorosulphonated polyethylene, ethylene/propylene/diene (EPDM)

- elastomers, polyvinyl chloride, polyethylene terephthalate, polyvinylchloride, ABS, polystyrene, polymethylmethacrylate, polyurethane, polyacrylate, polymethacrylate, and polysiloxane, aromatic copolyimide, polyalpholefins, polythiophene, polyaniline, polypyrrole, polyacetylene, polyisocyanurates, and derivatives thereof, vinyl monomers, styrene, vinyl pyridines, N-vinyl pyrrolidone, vinyl acetate, acrylonitrile, methyl vinyl ketone, methyl methacrylate, methyl acrylate, 2-hydroxyethyl methacrylate, 2-hydroxyethyl acrylate; polyols, ethylene glycol, 1,6-hexane diol, 1,4-cyclohexanedicarbinol, polyamines, 1,6-hexadamine, 4,4'-methylenebis (N-methylaniline), polycarboxylic acids, adipic acid, phthalic acid, epoxides, ethylene oxide, propylene oxide, and cyclohexene oxide, polyalkylene glycols, polyethylene glycol, polypropylene glycol, vinyl polymers, polystyrene, polyvinyl acetate, polyvinylpyrrolidone, polyvinylpyridine, polymethyl methacrylate, organic liquid-soluble polysaccharides, functionalized polysaccharides, cellulose acetate, and crosslinked swellable polysaccharides.
18. The composition of claim 16 wherein the heat transfer medium further comprises a phase change medium selected from the group consisting of salt-hydrates, organic eutectics, clathrate-hydrates, paraffins, hydrocarbons, Fischer-Tropsch hard waxes, inorganic eutectic mixtures, acetamide, methyl fumarate, myristic acid, Glauber's salt, paraffin wax, fatty acids, methyl-esters, methyl palmitate, methyl stearate, mixtures of short-chain acids, capric and lauric acid, coconut fatty acids, propane and methane.
19. The composition of claim 10 wherein the coating is selected from the group consisting of azoles, benzotriazole, tolyltriazole, halogen resistant azoles, and substituted derivatives thereof.
20. The composition of claim 19 wherein the azole is selected from the group comprising of aromatic azoles, diazoles, triazoles, tetrazoles, benzotriazole, tolyltriazole, 2,5-(aminopentyl) benzimidazole, alkoxybenzotriazole, imidazoles, such as oleyl imidazoline, thiazoles, such as mercaptobenzothiazole, 1-phenyl-5-mercaptotetrazole, thiodiazoles, halogen-resistant azoles, 5,6-dimethyl-benzotriazole; 5,6-diphenylbenzotriazole; 5-benzoyl-benzotriazole; 5-benzyl-benzotriazole and 5-phenyl-benzotriazole, a combination of alkoxybenzotriazole, mercaptobenzothiazole, tolyltriazole, benzotriazole,

a substituted benzotriazole, and/or 1-phenyl-5-mercaptotetrazole, a mixture of a pentane-soluble imidazoline, a pentane-soluble amide, a pyridine-based compound, a pentane-soluble dispersant, and a solvent, and combinations thereof.

21. The composition of claim 10 wherein the coating further comprises an inorganic corrosion inhibitor compound.

22. The composition of claim 10 wherein powder is a carbon powder and the coating further comprises a lignin-based compound, ethylene oxide/propylene oxide (EO/PO) block copolymers, anionic surfactants, ionic surfactants and nonionic surfactants.

23. The composition of claim 10 wherein powder selected from the group of aluminium and aluminum alloys and the coating further comprises a cerium compound.

24. The composition of claim 10 wherein the powder is selected from the group of copper, silver, iron, steel and alloys thereof and the coating is selected from the group of mercapto-substituted thiodiazoles, amino-substituted thiodiazoles, and mercapto-substituted triazole, amino-substituted triazoles, oleyl imidazoline, triethanolamine and monoethanolamine.

25. The composition of claim 22 wherein the lignin-based compound further comprises at least one of a monovalent salt of lignin, free acid lignin, polyvalent metal salts of lignin. lignin sulfonic acid, alkali metal salts of lignin sulfonic acid, alkaline earth metal salts of lignin sulfonic acid, and ammonium salts of lignin sulfonic acid.

26. The composition of claim 10 wherein the powder is a carbon powder and the coating is selected from the group of alkali metal salts, alkali earth metal salts, ammonium salts, and alkyl ether phosphates.